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Chemical Signatures Associated with Nuclear Proliferation

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One initiative supported by the DOE Office of Nonproliferation and National Security is the CALIOPE (Chemical Analysis by Laser Interrogation of Chemical Effluents) Program. This program is supported by the integrated activities at five DOE National Laboratories; Lawrence Livermore, Los Alamos, Sandia, Brookhaven, and Pacific Northwest. CALIOPE intends to exploit the inadvertent release of effluents into process off-gas and other airborne waste streams from facilities engaged in nuclear proliferation activities. The CALIOPE Program is developing laser-based remote sensing systems that can detect and identify chemical emissions associated with nuclear materials development and processing activities. Therefore, full understanding of the range of potential proliferation facilities (the "targets") and the nature of their chemical emissions (the "source terms" and resulting "signatures") is a necessary requirement for the program.

LLNL has been given primary responsibility for determining proliferation scenarios and developing the "signatures list" for CALIOPE. Detailed engineering models that permit realistic estimates of the type and amount of effluents being released into the environment from processing facilities related to nuclear proliferation have been developed. LLNL's approach to addressing this complex and detailed study will be described. Chemical signatures resulting from specific production processes will also be presented.

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